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A Natural Prediction for the Higgs Boson Mass: $120^{+3.5}_{-1}$ GeV

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For John Ellis on the celebration of his 65th birthday...

We predict that the lightest CP-even Higgs boson mass lies within the range of 119.0 GeV to 123.5 GeV in the context of No-Scale $\mathcal{F}$-$SU(5)$, a model defined by the convergence of the $\mathcal{F}$-lipped $SU(5)$ Grand Unified Theory, two pairs of hypothetical TeV scale vector-like supersymmetric multiplets with origins in $\mathcal{F}$-theory, and the dynamically established boundary conditions of No-Scale Supergravity. With reports by the CMS, ATLAS, CDF, and DØ Collaborations detailing enticing statistical excesses near 120 GeV in searches for the Standard Model Higgs boson, all signs point to an imminent discovery. While basic supersymmetric constructions such as mSUGRA and the CMSSM have already suffered overwhelming reductions in viable parameterization during the LHC's initial year of operation, about 80% of the original No-Scale $\mathcal{F}$-$SU(5)$ model space remains viable after analysis of the the first 1.1 fb^{-1} of integrated luminosity. This model is moreover capable of handily explaining the small excesses recently reported in the CMS multijet supersymmetry search, and also features a highly favorable "golden" subspace which may simultaneously account for the key rare process limits on the muon anomalous magnetic moment $(g_{-}2)_\mu$ and the branching ratio of the flavor-changing neutral current decay $b \to s\gamma$. In addition, the isolated mass parameter responsible for the global particle mass normalization, the gaugino boundary mass $M_{1/2}$, is dynamically determined at a secondary local minimization of the minimum of the Higgs potential $V_{\min}$, in a manner which is deeply consistent with all precision measurements at the physical electroweak scale.

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I. INTRODUCTION

The Large Hadron collider (LHC) has accumulated to date up to 2.3 fb^{-1} of data from proton-proton collisions at a center-of-mass beam energy of $\sqrt{s} = 7$ TeV, already establishing firm constraints on the mass of the lightest CP-even Higgs boson. The CMS [1] and ATLAS [2, 3] Collaborations have uncovered appealing statistical excesses that hint of the properties of the Standard Model (SM) Higgs boson, though not yet approaching the five standard deviations essential to claim a conclusive discovery. CMS has reported a surplus of observed events above the Standard Model background estimation at about 120 GeV, positioned directly at a location where background competition against observation is particularly severe. Nevertheless, the extraordinarily rapid ramping up of the LHC luminosity has allowed large quantities of new data to be sufficiently swiftly amassed that a definitive resolution to the dual questions of the existence and mass of the Higgs boson could be imminent. Moreover, these observations beyond background expectations are also in good agreement with newly established constraints from searches for the Higgs boson by the CDF and DØ Collaborations [4]. No equally suggestive signal of supersymmetry has thus far been detected by CMS [5–11] or ATLAS [12–16], so that one may suspect the LHC's best initial chance to make a key discovery rests in all probability with the Higgs boson.

The anticipation for discovery of physics beyond the SM at the LHC is fervent, heightening attention on the task of ascertaining what particle physics models exists which can naturally accommodate, or even perhaps uniquely predict, a Higgs boson in the neighborhood of 120 GeV. The foremost contender for an extension to the SM is Supersymmetry (SUSY), a natural solution to the gauge hierarchy problem. Supersymmetric Grand Unified Theories (GUTs) with gravity mediated supersymmetry breaking, known in their simplest variations as as minimal Supergravity (mSUGRA) and the Constrained Minimal Supersymmetric Standard Model (CMSSM), have been exhaustively assessed against the first 1.1 fb^{-1} of integrated luminosity; an overwhelming majority of the formerly experimentally viable parameter space of these models has failed to survive this testing, and has now fallen out of favor. This fuels the question of whether there endure SUSY and/or superstring post-Standard Model extensions that can continue to successfully counter the rapidly advancing constraints while simultaneously providing a naturally derived 120 GeV Higgs boson mass, and while remaining potentially visible to the early operation of the LHC.

An attractive candidate solution to this dilemma may be found in a class of models named No-Scale $\mathcal{F}$-$SU(5)$ [17–27]. It has been demonstrated that a majority of the bare-minimally constrained [23] parameter space of No-Scale $\mathcal{F}$-$SU(5)$, as defined by consistency with the world average top-quark mass $m_{\rm t}$, the dynamically established boundary conditions of No-Scale supergravity, radiative electroweak symmetry breaking, the centrally observed WMAP7 CDM relic density [28], and precision LEP constraints on the lightest CP-even Higgs boson m_h [29, 30] and other light SUSY chargino and neutralino mass content, remains viable even after careful comparison against the first 1.1 fb^{-1} [27] of LHC data. We shall show that the light Higgs mass is stably predicted within this region to take a value between 119.0-123.5 GeV, consistent with the surplus of observed events in the analyses presented by the CMS, CDF, and DØ Collaborations. Significantly, the most promising subspace of this region includes secondary bounds on the flavor changing neutral current ($b \to s\gamma$) process, contributions to the muon anomalous magnetic moment $(g-2)_\mu$, and the rare decay process $B_s^0 \to \mu^+\mu^-$ [31], all of which cohere with spin-independent σ_{SI} [32] and spin-dependent σ_{SD} [33] scattering cross-section bounds on Weakly Interacting Massive Particles (WIMPs), in addition to fresh limits established by the Fermi-LAT Collaboration [34] on the annihilation cross-section $\langle\sigma v\rangle_{\gamma\gamma}$ of WIMPs using gamma-rays. This condensed subspace, an updating of our previously advertised "Golden Strip" [18], offers a more focused prediction of the Higgs mass of around 120-121 GeV. We emphasize that the prediction of the Higgs in the vicinity of 120 GeV has been an exceedingly natural and robust prediction of No-Scale $\mathcal{F}$-$SU(5)$, stable across the full model space, which we have consistently advertised over the course of a growing body of work [17–27]. The recent embellishments to the experimental support for this standing correlation furnish it with a greatly enhanced immediacy and interest.

II. THE $\mathcal{F}$-$SU(5)$ MODEL

The study launched here is built upon the framework of an explicit model, dubbed No-Scale $\mathcal{F}$-$SU(5)$ [17–24], uniting the $\mathcal{F}$-lipped $SU(5)$ Grand Unified Theory (GUT) [35–37] with two pairs of hypothetical TeV scale vector-like supersymmetric multiplets with origins in $\mathcal{F}$-theory [38–42] and the dynamically established boundary conditions of No-Scale Supergravity [43–47]. A more complete review of this model is available in the appendix of Ref. [22].

Utilizing the dynamically established boundary conditions of No-Scale Supergravity at the $\mathcal{F}$-$SU(5)$ unification scale, we have previously delineated the extraordinarily constrained Golden Point [17] and aforementioned earliest derived incarnation of the Golden Strip [18] which satisfied all current experimental constraints while additionally featuring an imminently observable proton decay rate τ_p [48]. The most constrictive constraint imposed upon the viable model space is the unification scale boundary on $B_\mu = 0$. Furthermore, through application of a "Super No-Scale" condition for the dynamic stabilization of the stringy modulus related to the $M_{1/2}$ boundary gaugino mass [19, 20, 23], this mass along with the ratio of the Higgs vacuum expectation values (VEVs) $\tan\beta$ [19, 20, 23] were dynamically determined.

The complete collection of supersymmetry breaking soft terms evolve from the single parameter $M_{1/2}$ in the simplest No-Scale supergravity, and consequently the particle spectra are proportionally comparable up to an overall rescaling on $M_{1/2}$, leaving the majority of the "internal" physical properties invariant. This rescaling capability on $M_{1/2}$ is not generally expected in competing supersymmetry models, due to the presence of larger parameterization freedom, particularly with respect to a second independent boundary mass M_0 for scalar fields. This rescaling symmetry can be broken to a slight degree by the vector-like mass parameter, although the dependence is rather weak.

III. THE GOLDEN STRIP

The Golden Strip is strictly defined by the mutual intersection of the bare-minimal constraints outlined in Ref. [23] with the rare-decay processes $b \to s\gamma$, $B_s^0 \to \mu^+\mu^-$, and the muon anomalous magnetic moment, as depicted in Fig. 1. The outermost borders of the large yellow region in Fig. 1 are circumscribed from the bare-minimal constraints. To summarize, the bare-minimal constraints are defined by compatibility with the world average top quark mass $m_{\rm t} = 173.3 \pm 1.1$ GeV [49], the prediction of a suitable candidate source of cold dark matter (CDM) relic density matching the upper and lower thresholds $0.1088 \leq \Omega_{CDM} \leq 0.1158$ set by the WMAP7 measurements [28], a rigid prohibition against a charged lightest supersymmetric particle (LSP), conformity with the precision LEP constraints on the lightest CP-even Higgs boson ($m_h \geq 114$ GeV [29, 30]) and other light SUSY chargino, stau, and neutralino mass content, and a self-consistency specification on the dynamically evolved value of B_μ measured at the boundary scale $M_{\mathcal{F}}$. An uncertainty of ± 1 GeV on $B_\mu = 0$ is allowed, consistent with the induced variation from fluctuation of the strong coupling within its error bounds and the expected scale of radiative electroweak (EW) corrections. The cumulative result of the bare-minimal constraints shapes the parameter space into the uniquely formed profile situated in the $M_{1/2}, M_{\rm V}$ plane exhibited in Fig. 1, from a tapered light mass region with a lower bound of $\tan\beta = 19.4$ into a more expansive heavier region that ceases sharply with the charged stau LSP exclusion around $\tan\beta \simeq 23$.

The condensed vertical slice embossed with gold in both plot spaces of Fig. 1 identifies the confluence of the bare-minimal constraints with the $b \to s\gamma$, $B_s^0 \to \mu^+\mu^-$, and muon anomalous magnetic moment processes. For

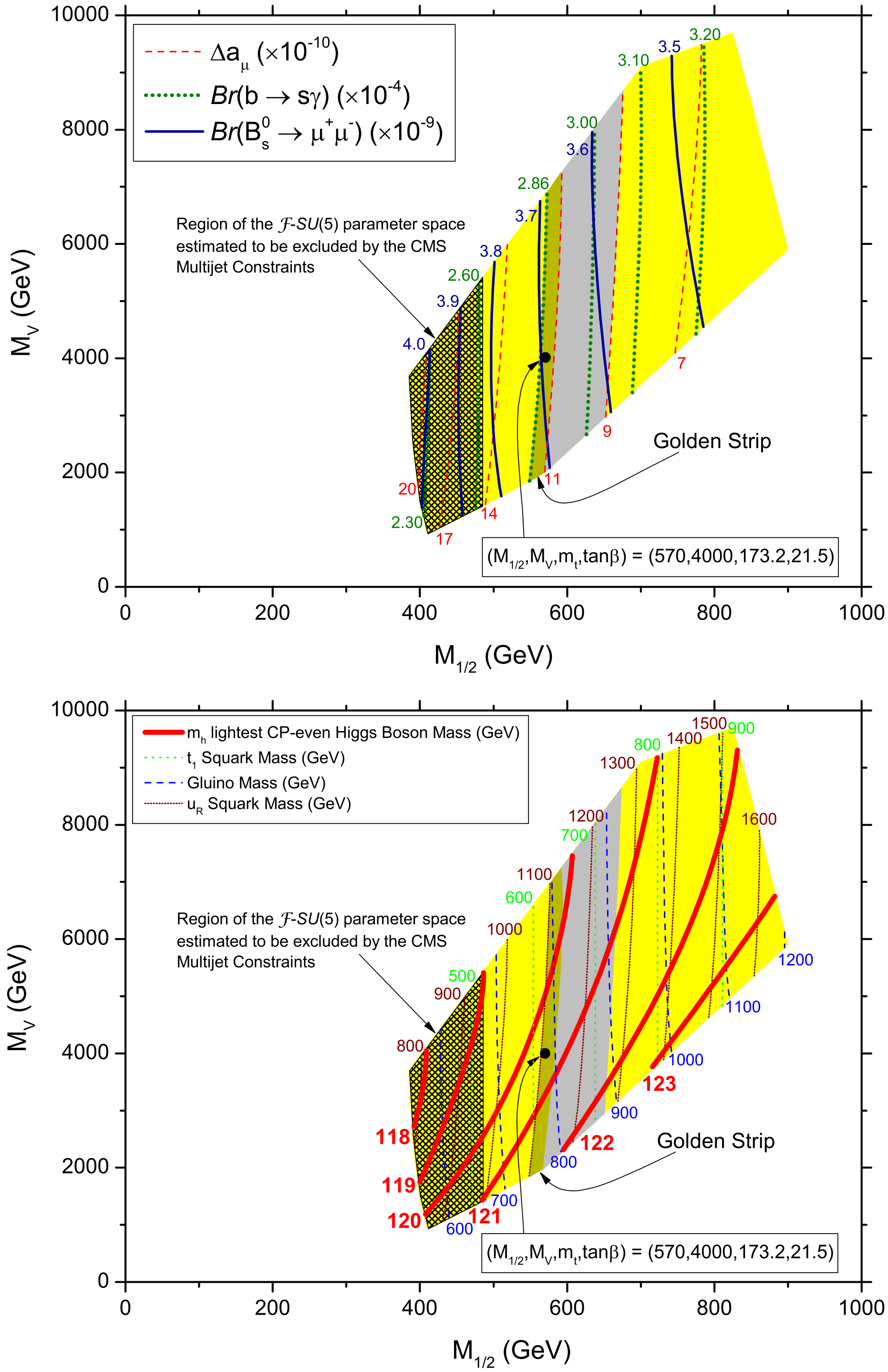

FIG. 1: The bare-minimally constrained parameter space of No-Scale $\mathcal{F}$-$SU(5)$ is depicted as a function of the gaugino boundary mass $M_{1/2}$, the vector-like mass $M_{\rm V}$, and via the solid, dashed, and dotted contour lines, the $(b \to s\gamma)$, muon anomalous magnetic moment $(g-2)_\mu$, and the $B_s^0 \to \mu^+\mu^-$ processes in the upper plot space, with the mass gradients in GeV of the light stop squark $\widetilde{t}_1$, gluino $\widetilde{g}$, right-handed up squark $\widetilde{u}_R$, and light Higgs mass m_h in the lower plot space. The region estimated to be disfavored by the first inverse femtobarn of integrated LHC luminosity is marked out with the crosshatch pattern. The vertical strip embossed in gold, referred to as the Golden Strip, represents an experimentally favored region consistent with the bare-minimal experimental constraints of [23] and both the $(b \to s\gamma)$ process and contributions to the muon anomalous magnetic moment $(g-2)_\mu$. The Golden Strip also includes the $B_s^0 \to \mu^+\mu^-$ decay, however this constraint is satisfied by the entire viable model space. The expanded region adorned in silver imposes these identical constraints, though with a more conservative estimate of $\Delta a_\mu = 27.5 \pm 18.5 \times 10^{-10}$. The labeled point is the benchmark of Table II.

the experimental limits on the flavor changing neutral current process $b \to s\gamma$, we draw on the two standard deviation limits $Br(b \to s\gamma) = 3.52 \pm 0.66 \times 10^{-4}$, where the theoretical and experimental errors are added in quadrature [50, 51]. We likewise apply the two standard deviation boundaries $\Delta a_\mu = 27.5 \pm 16.5 \times 10^{-10}$ [52] for the anomalous magnetic moment of the muon, $(g-2)_\mu$. Lastly, we use the recently published upper bound of $Br(B_s^0 \to \mu^+\mu^-) < 1.9 \times 10^{-8}$ [31] for the process $B_s^0 \to \mu^+\mu^-$. The more spacious vertical segment adorned in silver in Fig. 1 equally consists of all the above constraints, though adopting a more conservative estimate of the 2σ lower bound of $\Delta a_\mu \geq 9.0 \times 10^{-10}$. This shift is supported by a more recent experiment which suggests a downward shift of the central value [53]. Moreover, we remark that our greater confidence between these two experimental metrics is with those referencing $b \to s\gamma$, and that since the two key rare process constraints operate in overlapping opposition, the silver region actually comes closer to the central value of this branching ratio. We note that the entire Gold and Silver Strips remain unblemished by the first 1.1 fb^{-1} of LHC data, representing optimum candidate regions for the discovery of supersymmetry.

The intricate evasion of the full company of independent experimental constraints cataloged in the body of Table (I) may appear serendipitous, but it is certainly not accidental. The definitive phenomenological signature of No-Scale $\mathcal{F}$-$SU(5)$ which facilitates this dexterity is the rather unique encoding $M(\widetilde{t}_1) < M(\widetilde{g}) < M(\widetilde{q})$ of the SUSY particle mass hierarchy. This pattern of a stop lightest supersymmetric quark, followed by a gluino which is likewise lighter than the remaining squarks, is stable across the full model space, and has not been observed to be precisely replicated in any benchmark control sample of the MSSM, and in particular not by any of the "Snowmass Points and Slopes" benchmarks [54]. This hierarchy allows No-Scale $\mathcal{F}$-$SU(5)$ to bypass collider limits on light squark masses much more adroitly than CMSSM constructions with comparably light Lightest Supersymmetric Particles (LSPs). It is moreover directly responsible for a smoking-gun signal of ultra-high ($\geq$ 9) jet multiplicity events, which is expected to be prominently visible in LHC searches, given suitable data selection cuts [21, 22, 27].

The mechanism of this distinctive signature may be traced to the fact that the one-loop β-function b_3 of the $SU(3)_C$ gauge symmetry is zero due to the extra vector-like particle contributions [38]. The effect on the colored gaugino is direct in the running down from the high energy boundary, leading to the relation $M_3/M_{1/2} \simeq \alpha_3(M_Z)/\alpha_3(M_{32}) \simeq \mathcal{O}(1)$ and precipitating the conspicuously light gluino mass assignment. The lightness of the stop squark $\widetilde{t}_1$ is likewise attributed to the large mass splitting expected from the heaviness of the top quark, via its strong coupling to the Higgs. The vector-like particles, with a multiplet structure almost uniquely mandated by avoidance of a Landau pole within the $\mathcal{F}$-theory model building [38–42] context, are in turn necessary in order to achieve a substantial separation between the initial gauge unification of $SU(3) \times SU(2)_{\rm L}$ at $M_{32} \simeq 10^{16}$ GeV, and the secondary unification of $SU(5) \times U(1)_{\rm X}$ at $M_{\mathcal{F}} \simeq 7 \times 10^{17}$ GeV. This elevation of the final GUT scale, which is possible only within the context of a model with a two-stage unification like Flipped $SU(5)$, appears likewise to be necessary in order to successfully implement the the No-Scale boundary conditions, and in particular, the vanishing of the Higgs bilinear soft term B_μ. Crucially, this scenario appears to comes into its own only when applied at a unification scale approaching the Planck mass [55]. The dynamics of No-Scale Supergravity may themselves play an indispensable role in establishing the cosmological flatness of our Universe, and possibly even in allowing for the shepherding of a vast multitude of sister universes out of the primordial quantum "nothingness", while maintaining a zero balance of some suitably defined energy function.

TABLE I: Conformity with all the measured constraints for the Table II benchmark point $M_{1/2} = 570$ GeV, $M_V = 4$ TeV, $m_t = 173.2$ GeV, $\tan\beta = 21.5$. Here MM is used to designate the *minimum minimorum* of our universe.

Constraint	$\mathcal{F}-$SU(5) Value
$m_h > 114$ GeV	120.5 GeV
$m_t = 173.3 \pm 1.1$ GeV	173.2 GeV
$\Omega_{\widetilde{\chi}_1^0} = 0.1123 \pm 0.0035$	0.1100
$Br(b \to s\gamma) = 3.52 \pm 0.66 \times 10^{-4}$	2.88×10^{-4}
$\Delta a_\mu = 27.5 \pm 16.5 \times 10^{-10}$	11.5×10^{-10}
$Br(B_s^0 \to \mu^+\mu^-) \leq 1.9 \times 10^{-8}$	3.7×10^{-9}
$\tau_p \geq 1.0 \times 10^{34}$yr	5.1×10^{34}yr
$\sigma_{SI} < 7 \times 10^{-9}$pb	1.5×10^{-10}pb
$\sigma_{SD} < 4.5 \times 10^{-3}$pb	1×10^{-7}pb
$\langle \sigma v \rangle_{\gamma\gamma} < 10^{-26}$cm^3/s	2×10^{-28}cm^3/s
$M_Z = 91.187 \pm 0.001$ GeV	91.188 GeV(MM)

We select a benchmark from the Golden Strip representing what we believe to be the most optimum point to be assessed against experiment, as identified in Fig. 1 by the model parameters, with the spectrum of supersymmetric masses given in Table II. At the benchmark, the isolated mass parameter responsible for the global particle mass normalization, namely the gaugino boundary mass $M_{1/2}$, is dynamically determined at a secondary local minimization of the minimum of the Higgs potential $V_{\rm min}$ [20, 23] in a manner which is deeply consistent with all precision measurements at the physical electroweak scale, and in particular, the Z-boson mass $M_{\rm Z}$ itself [56]. Supplementing experimental constraints with the dynamical determination of this *minimum minimorum* of our universe, this point fulfills the inclusive group of well-established experimental and theoretical constraints, as summarized in Table I, merging a bottom-up experimentally driven analysis with a theoretically motivated top-down approach.

TABLE II: Spectrum (in GeV) for $M_{1/2} = 570$ GeV, $M_V = 4$ TeV, $m_t = 173.2$ GeV, tan$\beta = 21.5$. Here, $\Omega_\chi = 0.11$ and the lightest neutralino is 99.8% bino.

$\widetilde{\chi}_1^0$	115	$\widetilde{\chi}_1^\pm$	247	$\widetilde{e}_R$	214	$\widetilde{t}_1$	623	$\widetilde{u}_R$	1112	m_h	120.5
$\widetilde{\chi}_2^0$	247	$\widetilde{\chi}_2^\pm$	925	$\widetilde{e}_L$	602	$\widetilde{t}_2$	1039	$\widetilde{u}_L$	1209	$m_{A,H}$	1001
$\widetilde{\chi}_3^0$	921	$\widetilde{\nu}_{e/\mu}$	596	$\widetilde{\tau}_1$	123	$\widetilde{b}_1$	995	$\widetilde{d}_R$	1153	$m_{H\pm}$	1004
$\widetilde{\chi}_4^0$	924	$\widetilde{\nu}_\tau$	581	$\widetilde{\tau}_2$	590	$\widetilde{b}_2$	1101	$\widetilde{d}_L$	1211	$\widetilde{g}$	783

The distinctive $\mathcal{F}$-$SU(5)$ sparticle mass hierarchy responsible for a preponderance of the robust model characteristics summarized in this work is graphically illustrated in the lower plot space of Fig. 1. For direct correlation, in addition to the light stop $\widetilde{t}_1$, gluino $\widetilde{g}$, and $\widetilde{u}_R$ squark mass contours, we also demarcate the smooth Higgs mass gradient. The total model space beyond the hashed over region is not excluded by the CMS 1.1 fb^{-1} constraints, and assertively predicts a Higgs mass of 119.0 to 123.5 GeV, linked to a top quark mass within the world average 173.3 ±1.1 GeV. This inclusive span of Higgs masses is in precise agreement with the excess of data events observed by the CMS [1], CDF and DØ [4] Collaborations. Observe also that the Higgs mass in the entire model space is comfortably below the recently derived upper bounds of 145 GeV by CMS [1] and 146 GeV by ATLAS [2]. More specifically, notice that the Higgs mass in the Golden Strip is right about 120 GeV, in exact accord with the overall combined contributions of all individual Higgs decay channels observed by CMS above the Standard Model expectations [1].

In Fig. (2), we augment the analysis of Ref. [27] by superimposing the number of events generated in Monte Carlo simulation of our $M_{1/2} = 570$ GeV benchmark point from Table (II) onto a reprinting of the CMS Preliminary Standard Model background statistics from Ref. [11], featuring 1.1 fb^{-1} of collision data and a $\sqrt{s} = 7$ TeV beam energy. We impose upon the $\mathcal{F}$-$SU(5)$ signal a set of post-processing cuts designed to mimic those described in the CMS report. We emphasize that the $\mathcal{F}$-$SU(5)$ benchmark is quite capable of accounting for the observed event excesses, including most compellingly at the nine jet count, while avoiding any conspicuous overproduction. Although we do here attempt to conform with the $\mathcal{F}$-$SU(5)$ CMS post-processing cuts presented in Ref. [11], we maintain aggressive advocacy of the ultra-high jet cutting strategy described extensively in Refs. [21, 22, 25–27]. We believe that the discovery of a supersymmetry signal will most likely manifest itself in the data observations for nine or more jets; hence, a jet cutting strategy optimized for extracting supersymmetry from ultra-high jet events could prove to be more efficient at the LHC by one order of magnitude [27].

Furthermore, to emphasize the significance of the ultra-high jet cutting strategy in extracting a No-Scale $\mathcal{F}$-$SU(5)$ supersymmetry signal, we use the Discovery Index first presented in Ref. [25] and find that by implementing upon the benchmark point of Table (II) the CMS post-processing cuts of Ref. [11] though only retaining those events with nine jets or more, requires $8.5 fb^{-1}$ of LHC data in order to achieve a five standard deviation discovery of supersymmetry. This can be improved to only 1-$4 fb^{-1}$ by adoption of the ultra-high jet cutting strategy of [21, 22, 25–27], the key difference being a lowering of the p_T cut on jets from 50 GeV to 20 GeV. We offer the range from $1 fb^{-1}$ to $4 fb^{-1}$ in order to give consideration to alternate estimations of a comprehensive Standard Model background sample. Nonetheless, with projections of the LHC to possibly attain $10 fb^{-1}$ by the end of the year 2012, a five standard deviation discovery of an $\mathcal{F}$-$SU(5)$ supersymmetry signal using the CMS cuts is certainly achievable. However, a prerequisite of the utmost importance for this irrefutable discovery is that only those events with nine or more jets can be retained. For instance, if all events with 6 or more jets are retained while maintaining the CMS post-processing cutting strategy of [11], then the discovery threshold for $\mathcal{F}$-$SU(5)$ supersymmetry elevates to about $14 fb^{-1}$. Yet even more grave will be preserving all events with three jets or greater while implementing the CMS cuts of [5], where in this extremely detrimental scenario a massive $100 fb^{-1}$ of luminosity at the LHC will be required for a five standard deviation discovery of an $\mathcal{F}$-$SU(5)$ supersymmetric signal. Therefore, we would implore the CMS and ATLAS Collaborations not exclude the examination of events with nine or more jets from their analysis of the LHC data, or risk the not at all implausible circumstances of a masked and undetectable $\mathcal{F}$-$SU(5)$ supersymmetry signal. We stress that exclusion of the $\mathcal{F}$-$SU(5)$ model space in this respect is highly inadvisable, particularly considering all the very desirable phenomenological attributes we have highlighted in this work that endorse the No-Scale $\mathcal{F}$-$SU(5)$ as a principal candidate for the Supersymmetric Grand Unified Theory.

Our simulation was performed using the `MadGraph` [57, 58] suite, including the standard `MadEvent` [59], `PYTHIA` [60] and `PGS4` [61] chain, with post-processing performed by a custom script `CutLHCO` [62] (available for download) which executes the desired cuts, and counts and compiles the associated net statistics. All 2-body SUSY processes have been included in our simulation, which follows in all regards the procedure detailed in Ref. [22]. Our SUSY particle mass calculations have been performed using `MicrOMEGAs 2.1` [63], employing a proprietary modification of the `SuSpect 2.34` [64] codebase to run the RGEs. The Monte Carlo is typically oversampled and scaled down to the requisite luminosity, which can have the effect of suppressing statistical fluctuations.

IV. CONCLUSIONS

While the search for supersymmetry progresses at the LHC with no conclusive signal observed as of this date, the quest for the Higgs boson is rapidly accelerating. All indications from the CMS, ATLAS, CDF, and DØ Col-

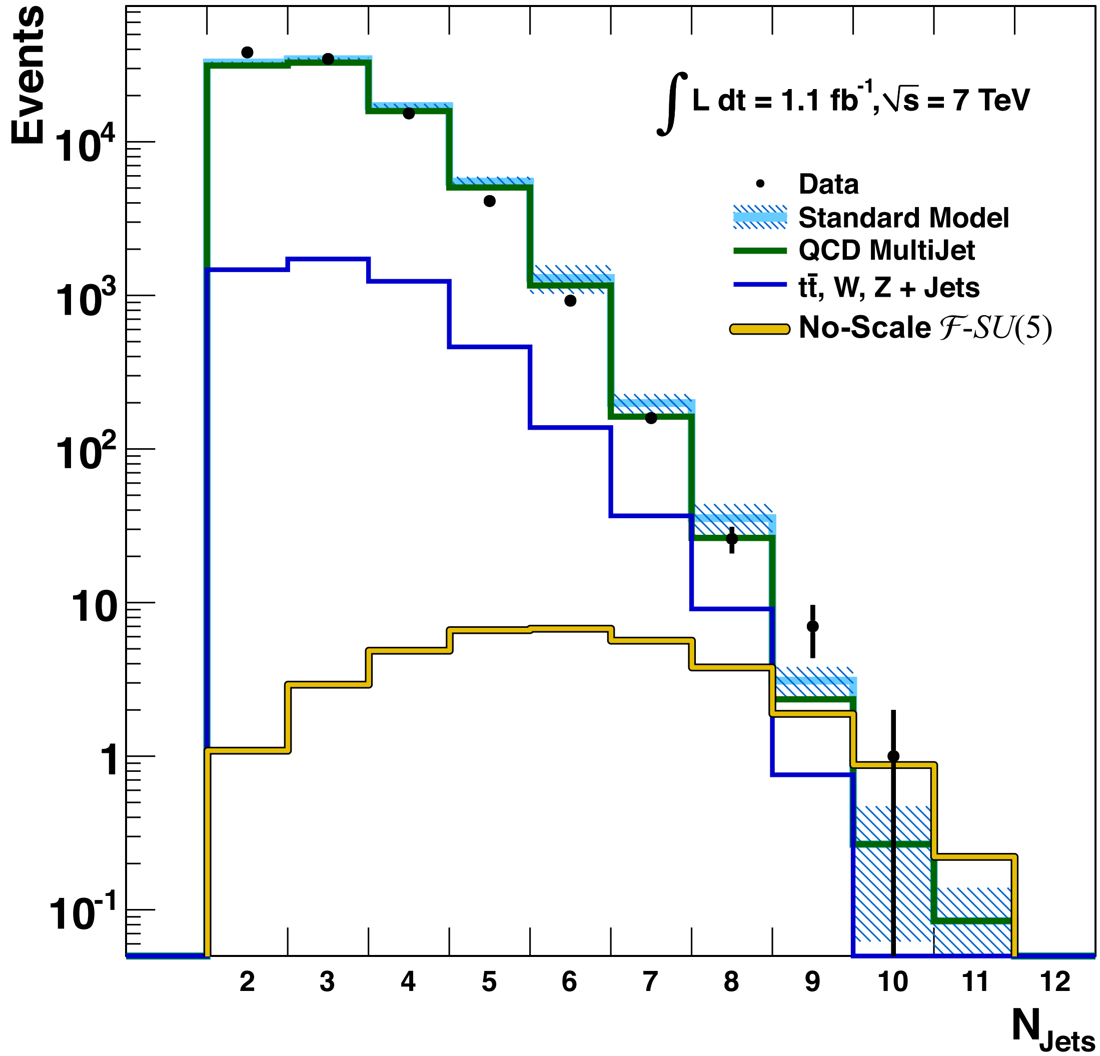

FIG. 2: The CMS Preliminary 2011 signal and background statistics for 1.1 fb^{-1} of integrated luminosity at $\sqrt{s} = 7$ TeV, as presented in [11], are reprinted with an overlay consisting of a Monte Carlo collider-detector simulation of the No-Scale $\mathcal{F}$-$SU(5)$ model space benchmark of Table II. The plot counts events per jet multiplicity, with no cut on α_{T}.

laborations suggest that a statistically significant observation of the Higgs boson at about 120 GeV could be on the near-term horizon, possibly by the end of 2011. It is thus imperative that we begin to spotlight those supersymmetric models capable of engendering a natural prediction for a 120 GeV Higgs boson mass. We have focused on one such model here by the name of No-Scale $\mathcal{F}$-$SU(5)$.

Applying only a set of bare-minimal experimental constraints, more than 80% of the resulting model space of the $\mathcal{F}$-$SU(5)$ remains viable after the first 1.1 fb^{-1} of luminosity at the LHC. Exposing a condensed subspace of this larger region where the bare-minimal constraints intersect the thresholds of the $b \to s\gamma$, $B_s^0 \to \mu^+\mu^-$, and muon anomalous magnetic moment processes, we have uncovered the most experimentally favorable region, dubbed the Golden Strip, which continues untouched by the rapidly advancing LHC constraints, remaining wholly viable for supersymmetry discovery. We found that the entire surviving model space naturally generates a Higgs mass of 119.0-123.5 GeV; the Golden Strip pinpoints the Higgs boson at about 120-121 GeV, in unconditional accord with the overall combined contributions of all individual Higgs decay channels observed by CMS above the expected Standard Model background. Selecting a representative point from a location within the Golden Strip where the dynamical determination of the secondary minimization of the minimum V_{min} of the Higgs potential agrees to high-precision with precision measurements at the electroweak scale, we assessed this benchmark for its ability to fit the CMS multijet data points and elucidate any unexplained statistical excesses in the first 1.1 fb^{-1} of LHC data reported by the CMS collaboration. The outcome was positive, with an interesting surplus of events at nine jets perfectly explicable within the realm of the No-Scale $\mathcal{F}$-$SU(5)$ Golden Strip.

For those physicists and non-physicists alike who have been patiently awaiting a categorical discovery of the Higgs boson for decades, the time may be at hand, as an exceedingly plausible prospect of a discovery near 120 GeV looms large over the coming months. Certainly, the first major discovery of the LHC era will generate warranted enthusiasm throughout the high-energy physics community, but we close with a brief suggestion of what the determination of a 120 GeV Higgs boson discovery might further disclose as to the structure of a more fundamental theory at high energy scales. In this respect, with the recent exclusion of mSUGRA and the CMSSM, a 120 GeV Higgs boson might be interpreted as a rather strongly suggestive piece of evidence to bolster the No-Scale $\mathcal{F}$-$SU(5)$ framework in particular, and string theory in general.

Acknowledgments

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